Spot Safety Project Evaluation

Project Log # 200712100

Spot Safety Project # 12-01-219

Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of US 64 and SR 1610 (Millersville Rd)
Alexander County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ _____
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-01-219 – The Intersection of US 64 and SR 1610 (Millersville Rd) in Alexander County, near the City of Taylorsville.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a 2-phase, actuated traffic signal. In the study period, US 64 and SR 1610 were both two-lane facilities at the subject intersection with US 64 providing additional right and left turn lanes on both approaches. The speed limits are 55 mph on US 64 and 45 mph on SR 1610. The subject location is a crossroads type intersection, which was controlled by dual posted stop signs on SR 1610 (Millersville Rd) with concrete median dividers.

In December 2007, SR 1610 was reconfigured at the intersection with the removal of the concrete median barriers and the installation and striping for left turn lanes and right turn slips. These additions were conducted under Spot Safety Project 12-06-207. The improvements were recommended following a fatal accident in October 2004 and the 2005 Highway Safety Improvement Program.

The original statement of problem for the signal installation was the excessive delay on SR 1610 and a pattern of angle collisions. The intersection met volume warrants 2 and 3B.

The initial crash analysis was completed from January 1, 1998 to December 31, 2000 with ten (10) reported crashes, four (4) of which were Angle Crashes. The final completion date for the improvement at the subject intersection was on December 2, 2002 with a total cost of $40,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from November through December 2002. The before period consisted of reported crashes from March 1, 1998 through October 31, 2002 (4 years and 8 months) and the after period consisted of reported crashes from January 1, 2003 through August 31, 2007 (4 years and 8 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure.

The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	20	27	35.00 %
Total Severity Index	19.49	7.37	- 62.18 %
Target Crashes	18	22	22.22 %
Target Crash Severity Index	21.54	8.48	- 60.63 %
Volume	10,480	12,950	23.57 %
Injury Crash Summary			
Fatal injury Crashes	0	1	100.00 %
Class A injury Crashes	4	0	- 100.00 %
Class B injury Crashes	5	6	20.00 %
Class C Injury Crashes	4	7	75.00 %
Total Injury Crashes	13	14	7.69 %

The naive before and after analysis at the treatment location resulted in a 35 percent increase in Total Crashes, a 22 percent increase in Target Crashes, but a 62 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 35 percent increase in Total Crashes and a 22 percent increase in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have increased at the treatment location from the before to the after period, although the crash severity benefited by over 60 percent.

Referencing the *Collision Diagram*, a large portion of crashes at the intersection in the before period (12 of 20) were an angle collision resulting from a vehicle improperly crossing US 64. After the signal installation, the angle pattern was reduced to six (6), which included one fatality and all resulted from a US 64 vehicle running the red indication. Left turn; same roadway type collisions also increased dramatically in the after period from four (4) to fifteen (15) crashes.

As a result of the after period fatal crash investigation at this location in October 2004, backing plates were added to the signal heads on US 64 due to sunlight being stated as a contributing factor to the red light running issue. Also, signal ahead signs were added on US 64 and northbound SR 1610. These countermeasures were still installed and operational when the field investigation was conducted by our office in March 2008.

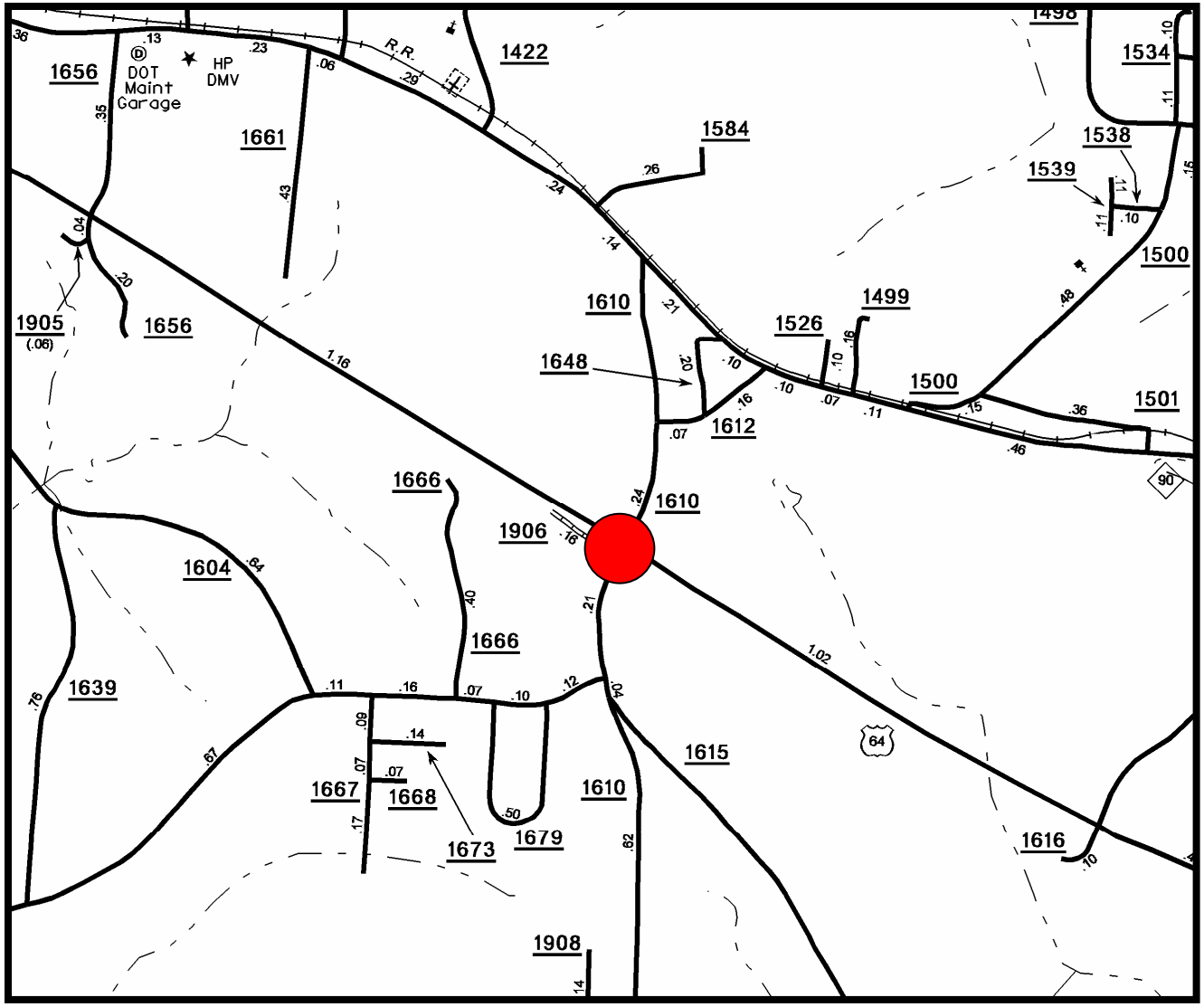
The calculated benefit to cost ratio for this project is 33.94 considering total crashes. The benefit to cost ratio considering only target crashes is 34.57. The benefits are calculated using the change in

annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection, although the configuration of SR 1610 shown is different from the configuration that was analyzed for this study, as explained in the *Project Background* section.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Alexander County
Evaluation of Spot Safety Project # 12-01-219



Treatment Location: US-64 at SR 1610 (Millersville Road) near Taylorsville

TREATMENT SITE PHOTOS TAKEN 3/17/2008

Traveling East on US-64

Traveling West on US-64

Traveling North on SR 1610 (Millersville Rd)

Traveling North on SR 1610

Traveling South on SR 1610 (Millersville Rd)

Traveling South on SR 1610

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US-64 at SR 1610 | BY: JBS
COUNTY: Alexander | DATE: 3/24/2008
FILE NO.: SS 12-01-219 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$40,000	10	0.149	$5,961
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$40,000	10	0.149	$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,861
TOTAL COST OF PROJECT= $40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	4	0.86	9	1.93	7	1.50	$468,801
AFTER	4.67	1	0.21	13	2.78	13	2.78	$168,030

Annual Benefits from Crash Cost Savings $300,771

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $291,910

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 33.94

TOTAL COST OF PROJECT - $40,000 **COMPREHENSIVE B/C RATIO - 33.94**

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US-64 at SR 1610 | BY: JBS
COUNTY: Alexander | DATE: 3/24/2008
FILE NO.: SS 12-01-219 | NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$40,000	10	0.149	$5,961
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$40,000	10	0.149	$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $8,861
TOTAL COST OF PROJECT= $40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

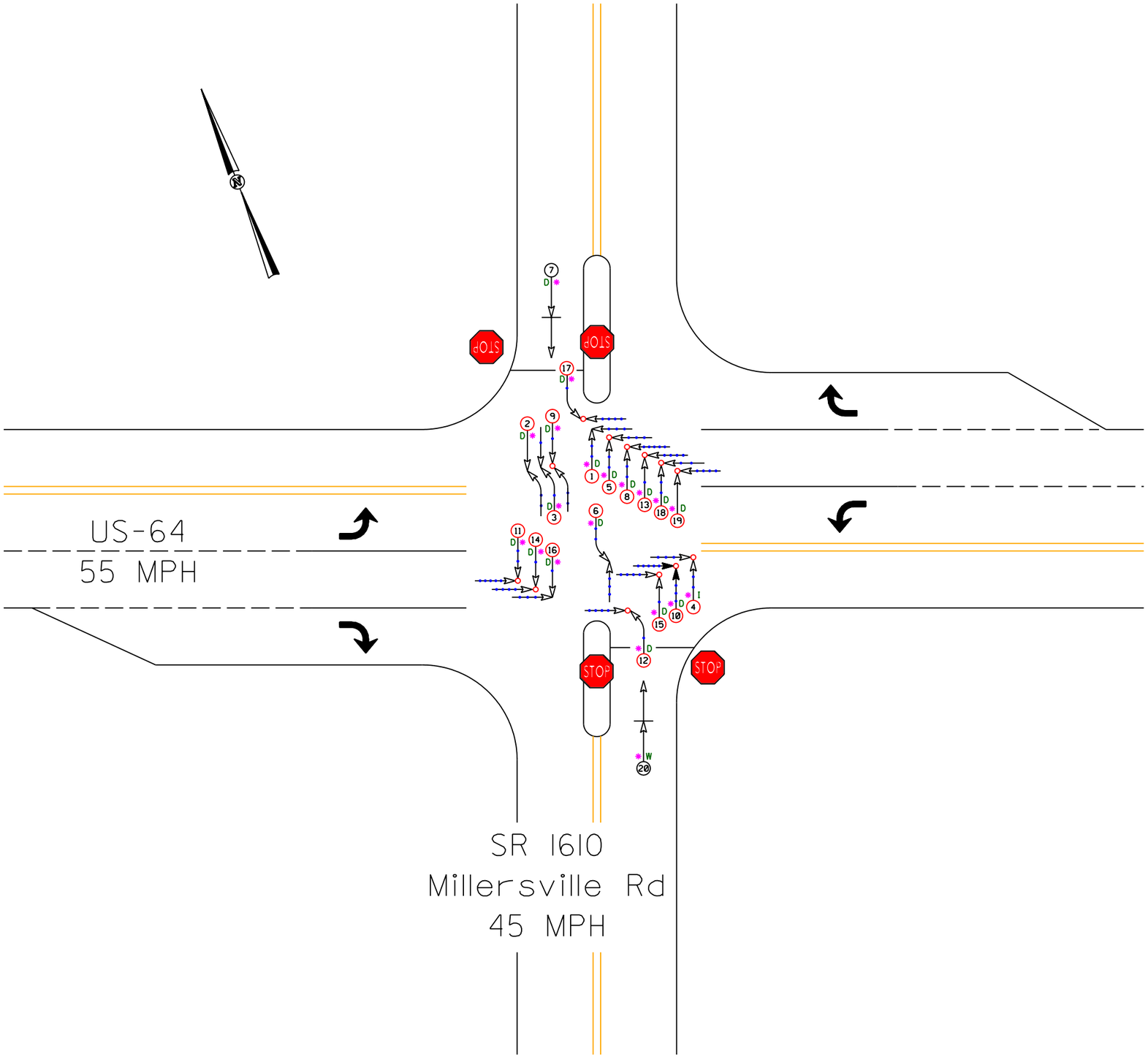
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.67	4	0.86	9	1.93	5	1.07	$467,131
AFTER	4.67	1	0.21	12	2.57	9	1.93	$160,835

Annual Benefits from Crash Cost Savings $306,296

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $297,434

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 34.57

TOTAL COST OF PROJECT - $40,000 **COMPREHENSIVE B/C RATIO - 34.57**



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

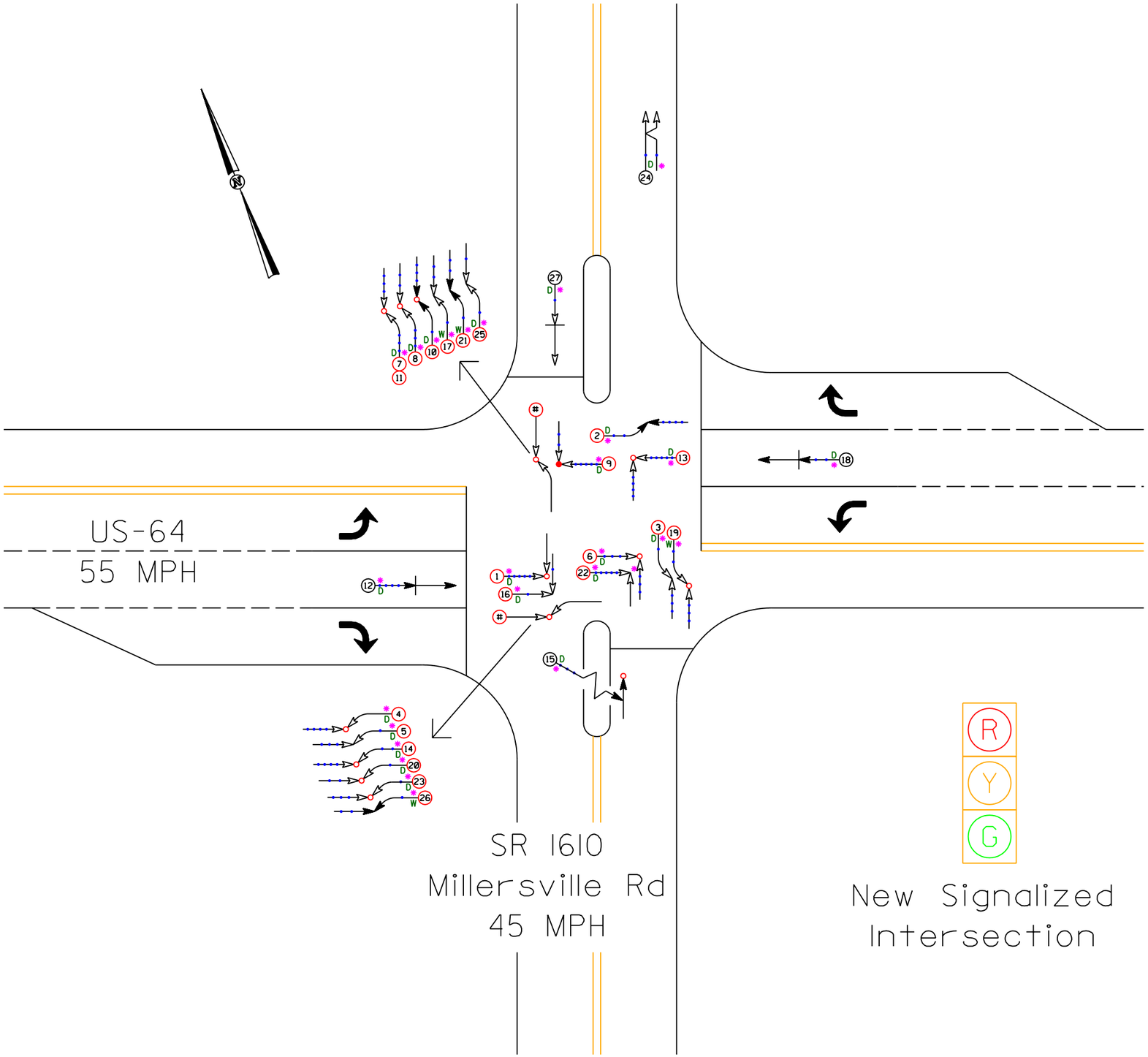
SS# 12-01-219
Alexander County
BEFORE Period
3/1/98 - 10/31/02
US-64 at SR 1610

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 12	AREA:
STUDY PERIOD: 3/1/1998 TO 10/31/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-7-2008	
LOG NUMBER: SS# 12-01-219	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH



LEGEND

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O OILY

SS# 12-01-219
Alexander County
AFTER Period
1/1/03 - 8/31/07
US-64 at SR 1610

R
Y
G

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 12	AREA:
STUDY PERIOD: 1/1/2003 TO 8/31/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 1-7-2008	
LOG NUMBER: SS# 12-01-219	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH